Gayana, Bot. 43 (1-4):15-17, 1986 ISSN 0016-5301

FIRST TOXIC BLUE-GREEN ALGAL BLOOM RECORDER FOR CHILE: A PRELIMINARY REPORT

PRIMER REGISTRO DE FLORACION DE ALGAS VERDE-AZULES EN CHILE: INFORME PRELIMINAR

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When freshwater ponds, lakes and water reservoirs become eutrophic, whether naturally or through man's intervention, microalgae blooms of some groups, such as Cyanophyceae, Bacillariophyceae and Chlorophyceae are likely to occur. Bloom formation is generally confined to waters sufficiently rich in dissolved plant nutrients, particularly nitrates and phosphates, to permit the growth of dense algal populations (Reynolds and Walsby, 1975).

Freshwater blue-green algae usually produce waterblooms in natural and man-made waters. The most common algal bloom forming genera are *Microcystis*, *Oscillatoria*, *Spirulina*, *Anabaena*, *Aphanizomenon*, *Gloeotrichia* and *Nodularia*. Some of toxic blue-green algal blooms may become concentrated inshore by gentle wind and wave action, the toxin can cause illness or dead in almost any mammal, bird or fish which ingest enough of the toxic cells or extracellular toxin. The number of waterblooms containing toxic blue-green algae is much greater than that estimated only in terms of animal deaths (Carmichael *et al.*, 1985). These authors present a map showing the world distribution of detected waterblooms of toxic freshwater and marine blue-green algae. Argentina is the only South American country included.

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Blue-green algal blooms in freshwater bodies of Chile have been reported, but none of them showed toxic properties (Thomasson 1963, Parra *et al.* 1981, Parra *et al.* 1982, Cabrera y Montecino 1982, Campos *et al.* 1983).

Toxins produced by some strains of blue-green algae include alkaloids, polypeptides and pteridines (Gorham and Carmichael, 1979, 1980; Carmichael, 1981).

During the last week of May 1985 (mid Fall) a massive fish mortality in a small lake ('Laguna Redonda') located in the north west area of Concepción City, South Central part of Chile, was reported. The principal morphometric parameters of Laguna Redonda are presented in Table 1.

Table 1
PRINCIPAL MORPHOMETRIC PARAMETERS OF LAGUNA REDONDA

Maximum length (1m)	210 m.
Maximum breadth (bm)	195 m.
Maximum depth (Zm)	18 m.
Mean depth (Z)	10.5 m.
Surface area (Ao)	28.792 m.2
Volumen.. (V)	300.370 m.3
Shore line (L)	625 m.
Development of shore line (D1)	1.04

Field observations, analysis of water samples and stomachs of dead and still living fishes confirmed the ocurrence of a very heavy bloom of *Microcystis aeruginosa* Kuetzing. Some preliminary toxicity bioassays were carried out. Samples were monitored for toxicity using the mouse bioassay after Scott *et al.*

(1981) and the method of Runnegar and Falconner (1981) was employed for isolation and purification of the toxin. Mice injected intraperitoneally with algal extracts or with toxin solution died within 30 minutes to 2 hours. The symptoms developed in mice receiving a lethal dosis were almost identical with other reports on toxic effects of *Microcystis aeruginosa* (Gorham 1960, Ostensvik *et al.*, 1981).

Fish stomachs analysis showed that *Microcystis aeruginosa* formed an important component of the stomachs content. These observations could support the hypothesis that the toxin of *Microcystis aeruginosa* caused the fishes mortality in Laguna Redonda. Four species of fishes were identified in Laguna Redonda: *Cheirodon galusdae*, *Gambusia affinis*, *Odonthestes bonariensis* and *Cyprinius carpio*. The bloom caused a considerable reduction of the fish stock in the small lake; the major damage was suffered by *Cheirodon galusdae* and *Odonthestes bonariensis*.

Seasonal phytoplankton succession were similar the last five years in Laguna Redonda. Waterblooms of *Peridinium willei* Huittf.-Kaas occurred year after year; other important contributors to the density of phytoplankton community were *Rhodomonas minuta* Skuja, *Melosira granulata* (Ehr.) Ralfs, *Sphaerocystis schroeteri* Chodat. Table 2 shows the species composition during the bloom occurrence. It is noteworthy that before the last five years no population of *Microcystis aeruginosa* or other blue-green algae representatives were recorded in Laguna Redonda.

Posible explanations for the bloom occurrence in Laguna Redonda include the eutrophic nature of the water body (caused by raw sewage discharge), the outbreak of the thermal stratification and a period of calm weather with high temperature recorded before the bloom development. The appearance of *Microcystis aeruginosa* bloom and its effects in Laguna Redonda were dramatic, that they even caused public alarm. This is the first incident of this nature ever documented in Chile, and further studies should be conducted in order to know the causes and thereby to prevent future similar phenomena.

Table 2
SPECIES COMPOSITION IDENTIFIED
DURING THE BLOOM

CYANOPHYCEAE
Microcystis aeruginosa Kuetz.
Microcystis incerta Lemm.

CRYPTOPHYCEAE
Rhodomonas minuta Skuja

DINOPHYCEAE
Peridinium willei Huitf.-Kaas

BACILLARIOPHYCEAE
Melosira granulata (Ehr.) Ralfs
Melosira hustedtii Krasske
Cyclotella meneghiniana Kuetz.
Nitzschia spp.
Synedra ulna (Nitz.) Ehr.
Asterionella formosa Hass.
Gomphonema spp.
Cymbella spp.
Cymatopleura solea (Breb.) W. Sm.
Hantzschia elongata (Hantz.) Grun.
Rhopalodia gibba (Ehr.) O. Muell.
Epithemia sorex Kuetz.

CHLOROPHYCEAE
Sphaerocystis schroeteri Chodat
Botryococcus braunii Kuetz.
Coelastrum pseudomicroporum Kors.
Nephrocytium agardhianum Naeg.
Kirchneriella contorta (Schm.) Bohl.
Oocystis lacustris Chodat
Quadrigula closterioides (Bohl.) Printz
Tetraedron minimum (A. Br.) Hansg.
Elakatothrix gelatinosa Wille
Closterium aciculare T. West
Staurastrum gracile Ralfs
Staurastrum gracile Ralfs var. *nyansae* G.S. West
Staurastrum leptocladum Nords. var. *cornutum* Wille
Staurastrum leptocladum Nords. var. *insigne* W. et G.S. West
Staurodesmus mamillatus (Nords.) Teil.

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